【CLAIMS】

【Claim 1】

An apparatus for preparing a synthesis gas from methane and an oxygen containing compound using an atmospheric pressure barrier discharge reaction, the apparatus comprising:

an inlet tube 1 mixing and introducing the methane and the oxygen containing compound into a reactor;

an internal electrode 3 of the reactor;

an external electrode 4 made of a metal thin film of the reactor;

a quartz tube 5 constituting a body of the reactor and serving as a dielectric;

a methane reforming catalyst layer 8 filled in the atmospheric pressure barrier discharge reactor consisting of the quartz tube 5 so as to induce a catalyst reaction;

a heating member 9 mounted to heat the catalyst layer 8 only;

a power supply 6 supplying currents to the internal and external electrodes to generate plasma;

electric wires 10, 11 in which currents flow;

a current-grounded part 12; and

an outlet 2 for discharging a product (synthesis gas) prepared as a reaction is completed into an exterior.

【Claim 2】

The apparatus according to claim 1, wherein the oxygen containing compound is one selected from a group consisting of carbon dioxide, water and air.

【Claim 3】

The apparatus according to claim 1, wherein the external electrode 4 is made of a metal coated to be thin on the quartz tube 5 with a thickness of 0.5 mm or less.

【Claim 4】

The apparatus according to claim 1, wherein the catalyst of the methane reforming catalyst layer is one selected from a group consisting of nickel catalyst, noble metal catalyst, alkali metal catalyst and alkali earth metal catalyst.

【Claim 5】

The apparatus according to claim 1 or 4, wherein the catalyst is nickel catalyst.

【Claim 6】

The apparatus according to claim 1, wherein a temperature of the heating member 9 is maintained to be 200~400℃.

【Claim 7】

A method for preparing a synthesis gas from methane and an oxygen containing compound using an atmospheric pressure barrier discharge reaction, the method comprising:

a first step of filling a catalyst in a reactor consisting of a quartz tube 5 constituting a body of the reactor and serving as a dielectric at the same time, and heating the methane reforming catalyst layer 8 with a heating member 9;

a second step of mixing the methane and the oxygen containing compound when a temperature is maintained to be 200~400℃ through the first step and then introducing the mixture into the reactor via an inlet tube 1;

a third step of applying a high voltage to an internal electrode 3 of the reactor and an external electrode 4 consisting of a metal thin film of the reactor using a power supply 6 simultaneously with the second step to generate plasma in the reactor consisting of the quartz tube 5, thereby preparing a synthesis gas; and

a fourth step of discharging the synthesis gas obtained in the third step to an exterior via an outlet 2 of the reactor.

【Claim 8】

The method according to claim 7, wherein the oxygen containing compound is one selected from a group consisting of carbon dioxide, water and air.

【Claim 9】

The method according to claim 7, wherein the catalyst in the first step is a methane reforming catalyst and is one selected from a group consisting of nickel catalyst, noble metal catalyst, alkali metal catalyst and alkali earth metal catalyst.

【Claim 10】

The method according to claim 7 or 9, wherein the catalyst is nickel catalyst.

【Claim 11】

The method according to claim 7, wherein a temperature of the heating member 9 is maintained to be 200~400℃.

【Claim 12】

The method according to claim 7, wherein the methane and the oxygen containing compound introduced in the second step react while passing through a region 7a in which the plasma only exists among an area 7 in which the plasma is generated in the reactor in the third step, and complete the reaction while passing through a successive region 7b in which the plasma and the catalyst are mixed.

【Claim 13】

The method according to claim 7, wherein the external electrode 4 is made of a metal coated to be thin on the quartz tube 5 with a thickness of 0.5 mm or less.